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PSYCHOLOGY AND SCIENTIFIC METHODS

NOTES ON THE DISCERNMENT OF LIKENESS AND OF UNLIKENESS

THIS research aimed to help the analysis of the mental process by which we become aware of similarity and of dissimilarity. Its method is experimental and it reports the simplified laboratory-judgments as to the likeness and unlikeness experienced in the case of a series of visual forms. The experiments of the work were performed in the psychological laboratories of Columbia and of Harvard universities. The simple-enough apparatus employed consisted of the blots of ink introduced into experimental psychology by the writer and described in the *Psychological Review* of July, 1897. From about five hundred of these largely chance ink-blots made on paper 4 cm. square and mounted on thick pasteboard of like size, one hundred were taken as they chanced to lie in a box, that is, quite at random. The backs of the blot-cards were numbered consecutively from one to one hundred for ready identification. Besides these, four other ink-blots were selected to constitute the norms with which the others were to be compared as to their respective likeness or unlikeness. A wire frame to hold fixed the norm-blot convenient to the subject's vision and a table on which the century of blot-cards could be arranged ten-square in numerical order completed the apparatus employed.

The subjects employed in this research were twenty in number; two were philosophical professors, one an instructor, and two assistants in psychology, while the rest, with one exception, were students in the two laboratories where the experiments were performed, the exception noted being a college graduate. The subjects were all males ranging in age between twenty and forty-three. The chief interest and work of one of the subjects lay in the art of music—a circumstance whose influence will be noted later on. The interests of the others were certainly sufficiently varied to prevent the occurrence of bias in any direction in their subjective reports, no one avowing or evincing any particular prejudice as regards the nature

of the processes under inquiry. All the subjects employed were sufficiently familiar with psychological analysis to afford both their introspection and their subjective reports the requisite accuracy. Here, as nearly always, however, the chief stress was laid on actual reactions rather than on more or less uncertain and ambiguous mental images and ideas, on the principle that bodily reactions express better than other means, even to the subject himself, his real meaning and intention—a fact too often overlooked, perhaps, in the laboratory of psychology.

The method of experimentation in detail was simply as follows: The hundred blot-cards being placed in order ten-square on the table before the seated subject and the norm in its frame conveniently before his eyes and above the blots, he proceeded to select within fifteen minutes the ten blot-cards out of the hundred most similar in form or shape to the norm, and to place them one side arranged carefully and deliberately in the order of their judged similarity to the norm. Meanwhile the subject reported how he apperceived the norm and what he considered its most essential form—characteristics and peculiarities. These subjective notes were recorded and the numbers of the ten blots judged most like the norm, and in their chosen order. The time required for a selection satisfactory to the subject was also recorded, and at the end of the selection the reason why each of the ten had been preferred, concisely as possible. The process in the case of judgments as to unlikeness was precisely the same, with the appropriate change in intention to keep dissimilarity instead of similarity in mind. The subject was not allowed to turn any blot-card about or to observe the characters from more than one view-point, that, namely, directly in front, but no objection was made to orientation in imagination if the subject seemed impelled to so vary its meaning to himself. This was allowed for the sufficient reason that with characters so full of suggestive meaning as are many blots of ink it is impossible to prevent their adjustments in imagination without disturbing deeply the judging and selecting process. On this matter of position lay one of the interests of the experiments, for, in the complexity of psychic association, to turn a blot a few circular degrees is often to make it seem an entirely different object with quite different meaning for a particular percipient.

Altogether, about nine hundred judgments were recorded and explained, the details of these explanations from introspection on a basis of precise objective stimulus constituting an interesting study in themselves, which here we shall not touch upon. We shall be content to indicate the general nature of the judgments as a whole and the principles of likeness and unlikeness which these judgments,

so far as they go, empirically demonstrate in the range of the experiments.

The nature of the apparatus employed is obviously such that statistical results are for the most part of little use and photographic reports of the judgments made would have to be so numerous as to be impracticable. Careful and extended study and comparison of the sets of blots selected by the various subjects, however, brings out several striking facts as to the mental process concerned, the most interesting of which are as follows:

The average size of these visual objects was such that ocular contour-movements probably were not much concerned in perceiving them. The projections, to be sure, tend after a while to be counted in an indefinite sort of way and their general shapes and directions noted. The blots are, however, too small to need outlining and are at once apprehended as units, just as are long words familiar to us. Be that as it may, the most conspicuous criterion of likeness and of unlikeness alike in these selections was what we may call relative massiveness. If the norm-blot happened to be noted as massive or as attenuated or as a mixture of these two, selection was made accordingly. This appears continually in the results of the experiments. This difference was noted immediately in practically all the cases where animal associations did not occur, thus crowding it out. It implies, apparently, a fundamental criterion in comparison-judgments of form and gets its bodily basis in the relative number of retinal local signs bunched in the perception, rather than in ocular contour-movements. This is apparently the most conspicuous of the sorts of "change of consciousness" which underlie our apprehension of likeness and unlikeness.

Another result of these judgments appears to be our excessive dependence on language-concepts for a clear awareness even of pure form. In almost every case the choices had their criteria of sameness or of difference sharply defined in words, expressed or not, of the subject. However pragmatic in their life-philosophy, all these subjects save one were obviously strong conceptualists. They made no progress in characterizing the norm-blot to themselves until words had arisen in their minds to make its character or characters definite and sharp. The sensational basis of the apperceiving process (a mass of retinal local signs plus a tendency to contour-movements) by itself led to no clear apperception of the blots. Whatever the confused experiences might be on perception of the blots, there was no clear notion of likeness or of unlikeness, no decided change in consciousness, until ideation had had its say. This would probably not be looked for in a set of subjects outside of college influence, where ideation is taught too often as the end-all and the be-all here.

Indeed, the only subject who claimed to have a true *feeling* of likeness and of unlikeness was a student of music, naïve enough as a student of psychology. He, too, had the concepts associated with the respective blots, but he avowed a distinct feeling of similarity and of dissimilarity which persisted. It needs only a glance at the sets of blots chosen by him and compared with those of others to show that his choices were by far the most satisfactory of all the subjects' sets. The explanation is not afar off: Even these simple bluish-black forms in only two dimensions have so many characters that to specify one, or two, or three, and compare them by these leads to imperfect and misleading results. On the other hand, the "feeling" of likeness or of unlikeness implies a much wider acquaintance with the blots and is, therefore, the basis of a better comparison. Related here is obviously an important educational principle which he who runs may read.

These experiments, again, illustrate the high stage which symbolism has reached in our social mental process. In nearly every case the subject found difficulty in inhibiting the reproductive imagination of animals, starting from the norm and extending to the blots chosen as like or unlike it. This process was interesting, but, being foreign to the topic in hand, was excluded because it led to comparisons obviously artificial. It was, however, often only with difficulty that most of the subjects could be induced to perceive the characters as mere chance-blots of ink, as masses of black color filling in an absolutely meaningless outline on a bit of white paper. If this inhibition were not insisted on (as at first it was not) the subject compared imagined animals rather than blots. One man, for example, promptly said the norm was a bird and thereupon chose ten "birds" flying, standing, roosting, swimming, swans and eagles, storks and humming-birds. However, it was not difficult for the subjects to overcome this symbolic menagerie-habit, so to say, and to use other criteria than those suggested by the associative imagination.

The two preceding results from these simple experiments (namely, the highly conceptual, and highly symbolic, characters of the class of perceptions here concerned) lead to suggestions as to the subjectivity of likeness as a mental fact. One thinks of Bradley's surprising collection of "objects that do not exist" when one sees how various are the qualities ascribed to this set of objects. As a matter of fact, these differ, for the most part, only in mere outline, by which they may be arranged as like or as unlike. One tends *pro tanto* to lose faith in mere ideas raised in the idea-overburdened mind when out of a hundred blots compared with a norm one sees seventy-one chosen as "similar" to it. Three blots were chosen by each of seven subjects, one by six subjects, six by five subjects, seven by four sub-

jects, ten by three, sixteen blots by two subjects, and twenty-six by only one subject—these numbers applying to one norm, but being of average sizes. When one lay out the sets chosen by the concept-criteria the differences in the blots often struck him more forcibly than did their sameness. Yet each subject had all the time he wished for his selection and made a deliberate choice, as deliberate at least as real life would usually allow of his making in comparing actual experiences. Only very rarely, moreover, would the actual objective similarity in life be as narrowly confined as in the conditions of these simple experiments.

Within the number of those subjects who chose their similar and dissimilar blots by ideal (rather than by affective) criteria, there is a considerable range of formal accuracy, dependent on the ideas employed. Some ideal criteria were obviously more essential than others and led to the selection of a set of blots evidently like each other and the norm. Ideal criteria gave more accurate results in the dissimilarity choices than in the similarity choices. This is, as we should expect, on logical principles. The awareness of unlikeness is an easier, if not a simpler, process apparently than that of likeness, for the change of consciousness is greater and so easier to appreciate. At any rate, the sets of blots chosen as unlike the norm were much more certainly unlike it than were the "similar" blots chosen like it.

As we pass, it is not improper to note the indirect evidence afforded by these experimental results of the motivity of even conceptual consciousness. Ignoring the larger questions as to understanding, there is here ample illustration that such a cognitional process as the comparison of bidimensional forms does not ordinarily find issue until the actual *word* symbolic of a concept is fairly clear in consciousness. If it gives the subject the impression that it "appears" out of his vague subconsciousness (as often is the case) that is another problem that need have here no further mention. This conscious-becoming of an actual word can mean nothing else, it seems, than the innervation of those muscles and glands whose proper coordination would utter the word. Such dependence of an intellectual process as general as that of a judgment of likeness or of unlikeness upon the activity of the neuromuscular mechanism of speech is not any too frequently at hand. Here it can be taken for what it is worth in the doctrine of the relations of body and mind.

Were we to summarize and fuse the notions inductively suggested by this little research we could emphasize that judgments of bidimensional forms, when not geometric, are more accurately made by "feeling"-criteria than by conceptual criteria. The subjects who paid most attention to the actual visual sensations (retinal and oculomotor) as objectified in *looking at* the blots instead of *thinking about*

them, made the best, that is, most similar and most dissimilar, selections. The former in choosing similar forms kept the change of consciousness at a minimum by their method, for they retained in mind a more or less true image of the norm. The latter, the conceptualists, on the contrary (but only after innervating for the word), replaced the original visual image with a more or less partial concept and repeated it in their choices, but more or less forgot meanwhile the shape of the norm. The practical application of this principle, familiar to psychologists, to affairs, for example in the taking and evaluation of evidence in legal trials, should not be further delayed, especially since rather numerous researches along various similar lines (that of Cattell, for example) have all pointed to the same really important fact that what we see or hear or feel is often determined as much from within as from without ourselves.

Another result of this work that may be mentioned is its emphasis on the practical value of affective impressions in comparison with knowledge that is purely cognitional. It is outside of the experimental results somewhat, of course, but it may be strongly believed that this principle is continually acting often to our disadvantage, and especially in education, in our relations with our generally experienced environment, and with each other. As demonstrably here, the learning mind, through too little attention to this matter, is led frequently to errors that might be often avoided did it allow greater and more nearly natural freedom to the sensational and especially to the affective aspects of our mental process. In education we are undoubtedly apt to overdo ideation and to underdo the affective phases of the developing mind. Greater objective activity in the free realms of feeling and less reliance on the "apperception-mass" would surely lead the child to see things as they are rather than as a more or less formal and hereditary association of ideas compels him to think them.

The one other result that appears most noteworthy of those suggested by this work is its evidence for the neuromuscular basis of conceptualization—evidence coming, it is true, perhaps not less from within than from without! These chance-characters as a rule have in them a minimum certainty of conceptual symbolism—that is, on the average, they are about as far away in shape from language-symbols as any forms that could be devised. None the less, as we have seen, they usually start some conceptual associations, more often, on the whole, than trains of imagination, and they start these associations, so to say, without a push, without giving them more than the needful minimum of bias in any one direction—they introduce the energy but do not guide its course. Under these circumstances the association-time and especially the wholly subconscious start is

very long oftentimes. Often, as we have seen, the consciousness was to introspection a mere confused and scarcely conscious jumble of more or less unpleasant strains in and about the head, eventuating, however, sooner or later in a *word* clearly thought or even spoken aloud. In the usual form of word-association measurements, in the formerly so numerous researches on reaction-time, the symbol used as a stimulus was either a printed or a spoken language-symbol and therefore in the closest cerebral connection with the muscular innervations, etc., of language-expression as developed in the brain when the individual learned to understand and speak and write. In these cases, on the other hand, the stimuli were no such familiar symbols, practically part of the language-expression mechanism, but were rather almost unrelated stimuli, abstract, so to say, rather than concrete. None the less, after a time the speech-innervations were suitably set going.

It is hard to believe that this difficulty of language-association under these circumstances is other than the difficulty of making "new" pathways, combinations, in the expression-neurones of the brain. This means, probably, each time a new struggle through unaccustomed innervations of speech-muscles. There is apparently no other neurologic basis for the confusion and the delay. These last were both experiences unpleasant to the subject and tended, therefore, to be eliminated by repetition and habit, if it were possible; yet they were neither eliminated nor much shortened, at least within the limits of these experiments. Neurologically this is interesting, this slow and unpleasant fumbling around of a sense-impression among the infinite possibilities of cortical (and nuclear?) routes. It is interesting, too, in a broader way, philological and psychological, in so far as it suggests that, in the human mind as of old in the great empire, all roads, even the most unlikely trail of a chance ink-blot form, lead sooner or later into the (mostly muscular and epithelial) innervations of language-expression—the one function characteristic of humanity. As has already been suggested, these stimuli were as far as possible from language-symbols of any language, and the outcome of the association-process was, therefore, all the more striking and suggestive, however inferior the determination of likeness and unlikeness by this process as compared with the few cases where the cerebral association remained of the affective aspect.

Recent advancement in biochemistry and especially in neuro-metabolism has made possible suggestions more definite by far than ever before as to the real nature in scientific terms of these innumerable influences darting through the cerebral maze that psychologically we discuss as subconscious associations. However interesting, however, such speculations may be, the broader questions

as to the relationship of mental "energies" to the forces we know as chemic and electric must outweigh in interest the purely physiologic problem. How can we designate for proximate scientific use the ultimate nature of the neurogram, the memory-trace, the endless and perhaps ineffaceable "vestigia" of ever unique experiences? And if we could and did "connote" them, should we not forthwith find it quite impossible to discriminate the energies we described from the thing we speak of as consciousness, with its sthenic and asthenic conditions, its dynamogeny, its varying qualities and quantities and durations, and the other numerous characters which it shares with the "somewhats" that even the avowed dualist (if he truly exists still) speaks of as energies? In fine, then, why do we not give up this two-faced terminology of a bygone time and speak the straight language that leads to clear thinking and to real knowledge in terms that are ultimate? To the present writer it is unknown what proportion in general of the psychologically informed consider that ideation (as well as feeling and willing) is immediately interknit with ("dependent on") the innervation of the muscles and glands that would express the concerned ideas. One would almost assume that nearly all psychologists who know their physiology fairly well (they are none too numerous) would nowadays thus presume the basis of thought, for gradually the psychophysiologic chasm is narrowing, or, at least, many firm bridges are being thrown across it; perhaps before we fully realize it we shall look in vain for the chasm itself!

However all this may be (the "physiology" of ideation and thought), here in this little research is adequate evidence, so far as it goes, that an idea comes plainly "into the mind," that it becomes clearly conscious, only with definite innervation and more or less deliberate and complete occurrence of the muscular movements that would express the concept in words. One can dimly *feel* the similarity or dissimilarity between two chance shapes, but in most persons, too many, perhaps, the feeling is useless and even oppressive, until definitely expressible in neuromuscular terms more definite and distinct than those of a feeling-tone: that is, articulated.

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